

Novel Hybrid CMOS X-ray Detector Developments for Future Large Area and High Resolution X-ray Astronomy Missions

Completed Technology Project (2017 - 2021)



Project Introduction

In the coming years, X-ray astronomy will require new soft X-ray detectors that can be read very quickly with low noise and can achieve small pixel sizes over a moderately large focal plane area. These requirements will be present for a variety of X-ray missions that will attempt to address science that was highly ranked by the 2010 Decadal Survey, including missions with science that overlaps with that of IXO and Athena, as well as other missions addressing science topics beyond those of IXO and Athena. An X-ray Surveyor mission was recently chosen by NASA for study by a Science & Technology Definition Team (STDT) so it can be considered as an option for an upcoming flagship mission. A mission such as this was endorsed by the NASA long term planning document entitled "Enduring Quests, Daring Visions," and a detailed description of one possible realization of such a mission has been referred to as SMART-X, which was described in a recent NASA RFI response. This provides an example of a future mission concept with these requirements since it has high X-ray throughput and excellent spatial resolution. We propose to continue to modify current active pixel sensor designs, in particular the hybrid CMOS detectors that we have been working with for several years, and implement new in-pixel technologies that will allow us to achieve these ambitious and realistic requirements on a timeline that will make them available to upcoming X-ray missions. This proposal is a continuation of our program that has been working on these developments for the past several years. The first 3 years of the program led to the development of a new circuit design for each pixel, which has now been shown to be suitable for a larger detector array. The proposed activity for the next four years will be to incorporate this pixel design into a new design of a full detector array (2k×2k pixels with digital output) and to fabricate this full-sized device so it can be thoroughly tested and characterized.



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

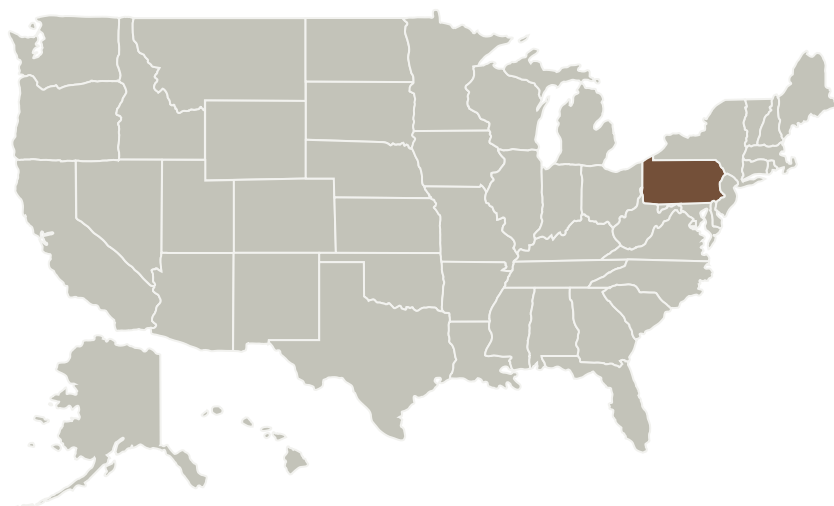
Astrophysics Research and Analysis

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Primary U.S. Work Locations and Key Partners



Primary U.S. Work Locations

Pennsylvania

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

Abe Falcone

Co-Investigators:

Jenna Neff

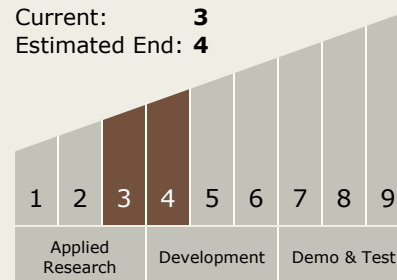
David N Burrows

Technology Maturity (TRL)

Start: 3

Current: 3

Estimated End: 4



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.2 Observatories
 - TX08.2.1 Mirror Systems

Target Destination

Outside the Solar System